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Evaluating AI's Efficacy in Enhancing Patient Education and Answering FAQs in Plastic Surgery: A Focused Case Study on Breast Reconstruction

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ABSTRACT

Background: The rapid advent of artificial intelligence (AI) and machine learning (ML) in the healthcare sector offers new horizons for patient education and has the potential to redefine patient-provider interactions. Our research aimed to gauge the efficacy of ChatGPT-4 in delivering accurate, current, and safe medical guidance on breast reconstruction, and benchmark its responses against other established patient information channels.

Methods: We presented ChatGPT-4 with six frequently posed questions about breast reconstruction. The model's replies were critically assessed by a committee of experienced plastic and reconstructive surgeons. To ensure the precision of the information, its responses were further cross-referenced against two major medical databases.

Results: The results revealed that ChatGPT-4 produced well-articulated, factually sound, and holistic answers to the presented inquiries. However, the platform showed constraints in offering tailored guidance and occasionally cited outdated or irrelevant references. Notably, the system consistently advocated for professional consultation for nuanced information.

Conclusion: ChatGPT-4 has emerged as a potential supplementary resource in patient education concerning breast reconstruction. Nevertheless, to harness its full potential and ensure its seamless integration into healthcare, further refinements and advancements in AI tools are paramount. The study underscores the importance of continuous evaluation and enhancement for AI solutions in the evolving landscape of patient education.

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INTRODUCTION

The rapid incorporation of artificial intelligence (AI) in healthcare is reshaping patient care and

clinical decision-making dynamics.¹ Language models, such as ChatGPT developed by OpenAI in San Francisco, CA, demonstrate remarkable capacity in analyzing vast datasets to generate responses similar to human communication.² As the world gravitates towards digitalization, AI-powered chatbots are garnering attention for their potential in addressing patient inquiries in the medical and surgical sectors, signifying a paradigm shift in global healthcare interactions between patients and

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providers.³ Opting for breast reconstruction is a profoundly personal choice, and many patients grapple with a myriad of queries about the procedure, its associated risks, and the expected results.⁴ Providing timely, precise, and evidence-grounded information is pivotal to guide informed choices and set patient anticipations. Earlier evaluations have established ChatGPT's ability to offer patient-centric information while minimizing the complexity of medical terminology.

With the growing demand for plastic surgery endeavors, including breast reconstruction, medical professionals confront the imperative of imparting thorough knowledge and backing to a swelling patient populace.⁴ AI-enhanced chatbots could serve as an answer to this challenge, presenting a user-friendly platform for patients to gain pertinent knowledge and voice their apprehensions. This could also temper the informational load on clinicians, allowing a more concentrated approach to patient treatment and procedure nuances.⁵

Our study delved into ChatGPT's informational depth, responsiveness, and competence in addressing typical inquiries from patients considering breast reconstruction. Mindful of ChatGPT's constraints highlighted in prior research, our analysis critiqued the chatbot's ability to reference accurately and the evidential strength buttressing its replies.^{6,7} This examination aims to shed light on the viability of AI-empowered chatbots as auxiliary tools for patient enlightenment and endorsement in the realm of plastic surgery.

METHODS

This study set out to explore the capability of artificial intelligence language models in delivering accurate and current medical information to the general populace. We utilized ChatGPT-4, among the most advanced language models presently available to the public, for this examination. We assessed its proficiency, depth, and precision in addressing prevalent queries posed by individuals regarding breast reconstruction. A panel of four expert plastic surgeons (G.L., F.C., D.M., and R.R.) crafted these questions in alignment with the American Society of Plastic Surgeons (ASPS) website.⁸ We ensured that subsequent questions remained unmodified based on preceding responses and did not prompt the system to recreate previously used answers.

We posed six frequently asked questions related to breast reconstruction to ChatGPT. Using subject matter experts and defined criteria, we meticulously examined its response strategy and content, evaluating its accuracy, depth, and user-friendliness. Four experienced plastic and reconstructive surgeons (G.L., F.C., D.M., and R.R.) specializing in breast

surgeries critically reviewed the given answers. Additionally, we cross-referenced ChatGPT's responses and citations against two comprehensive medical databases, PubMed and Scopus, to validate their relevance and correctness.

Given that ChatGPT-4 operates on a probabilistic algorithm, leveraging random sampling to craft diverse answers, it may produce varied responses to identical queries. For the purposes of this study, we strictly incorporated the initial answer that ChatGPT delivered for each question, disallowing subsequent amendments or elaborations. We took precautionary steps to ensure that each question posed was free from grammatical or syntactical errors. All questions were input on a singular day through a ChatGPT Plus account, equipped with access to ChatGPT-4, held by one of the contributing authors. No response provided by ChatGPT was excluded from our analysis.

RESULTS

The responses to the 6 questions asked to ChatGPT-4 are analyzed below.

What types of breast reconstruction could I have?

ChatGPT-4 response provides a comprehensive overview of the various breast reconstruction techniques, covering both implant-based and autologous reconstruction (Figure 1).

The information is organized in a clear manner, with distinct sections detailing each reconstruction method. The use of bullet points and subheadings enhances readability. The content appears neutral and does not seem to promote one method over another, which is crucial for unbiased patient education. The concluding remark emphasizing individual differences and the need for consultation with a board-certified surgeon underscores a patient-centered approach, which is in line with modern medical practice. The tone is informative and seems directed at patients or the general public. It does not overwhelm the patient with excessive medical jargon, which makes it accessible. The information provided is correct, referring to the most important aspects of autologous and prosthetic breast reconstruction.^{9,12,38,39}

When can the breast reconstruction be done?

The information provided by ChatGPT-4 elaborates on the temporal modalities of breast reconstruction post-mastectomy (Figure 2). The information provided to the patient in this question was succinctly summarized without grammatical errors. The tone is informative and seems directed at patients or the general public.



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What types of breast reconstruction could I have?

Breast reconstruction is a surgical procedure that restores shape to your breast after mastectomy or lumpectomy. The type of reconstruction that's best for you depends on several factors, including your medical history, body shape, whether you've had radiation or will need radiation, your personal preferences, and your surgeon's recommendations.

Here's an overview of the most common types of breast reconstruction:

- 1. Implant-based Reconstruction:** This is one of the most common methods. It involves the use of silicone or saline breast implants to rebuild the breast. It can be done in one or two stages.
 - **Two-stage reconstruction (Tissue Expander and Implant):** Initially, a tissue expander is placed under the chest muscle. Over time, saline solution is added to the expander to stretch the skin and muscle. Once it reaches the desired size, a second surgery replaces the expander with a permanent implant.
 - **Direct-to-implant (One-stage reconstruction):** The permanent implant is placed immediately after the mastectomy, without the need for tissue expansion.
- 2. Autologous or Flap Reconstruction:** This method uses tissue from another part of the patient's body (often the abdomen, but can also be the back, buttocks, or thigh) to create a new breast mound.
 - **TRAM flap (Transverse Rectus Abdominis Myocutaneous flap):** This uses muscle, fat, and skin from the lower abdomen.
 - **DIEP flap (Deep Inferior Epigastric Perforator flap):** This uses fat and skin from the lower abdomen, but usually spares the muscle.
 - **Latissimus Dorsi flap:** This uses muscle, fat, and skin from the back.
 - **SGAP flap (Superior Gluteal Artery Perforator) and IGAP (Inferior Gluteal Artery Perforator) flap:** These use tissue from the upper or lower buttock.
 - **TUG flap (Transverse Upper Gracilis flap):** This uses tissue from the inner thigh.
- 3. Fat Grafting:** This is often used in conjunction with other methods. It involves transferring small amounts of fat from one part of the body to the breast to improve contour and volume.
- 4. Nipple and Areola Reconstruction:** After the breast mound is reconstructed, an additional procedure can be done to reconstruct the nipple and areola. This can involve local tissue rearrangement, skin grafting, and/or tattooing.
- 5. Combination:** Some patients may undergo a combination of implant and flap reconstruction, depending on their needs and the surgeon's recommendations.
- 6. Prosthetic Breast:** Some women opt not to have surgical reconstruction and instead use a breast prosthesis or breast form that fits in a bra.

Remember, the type of reconstruction that's right for one person may not be right for another. The best approach is to consult with a board-certified plastic surgeon who specializes in breast reconstruction. They can provide a thorough assessment and discuss the options most appropriate for your specific situation.

Figure 1. Prompt: What types of breast reconstruction could I have?

Immediate reconstruction, executed concomitantly with mastectomy, has been observed to confer psychological benefits and might yield superior aesthetic outcomes due to the potential



preservation of breast skin.¹³ Delayed reconstruction, done weeks to years post-operatively, is often advocated for individuals necessitating post-

mastectomy radiation, as radiation can induce dermal and subdermal alterations compromising reconstruction quality.¹¹

GL When can the Breast reconstruction be done?

Breast reconstruction can be performed at different times relative to mastectomy or lumpectomy, and the timing can be influenced by various factors, including medical, surgical, and personal considerations. Here are the general timelines for breast reconstruction:

- 1. Immediate Reconstruction:** This is when breast reconstruction is performed at the same time as the mastectomy. The advantage of this approach is that the patient wakes up from surgery with a breast mound already in place, which can be psychologically beneficial for some. Another advantage is that it can result in better cosmetic outcomes since the skin over the breast might be preserved. However, not everyone is a candidate for immediate reconstruction, especially if post-operative radiation is anticipated, as radiation can impact the final appearance and health of the reconstructed breast.
- 2. Delayed Reconstruction:** This approach involves waiting weeks, months, or even years after mastectomy before undergoing reconstruction. This might be chosen or recommended if:
 - The patient requires radiation therapy after mastectomy. Radiation can cause changes in the skin and underlying tissue that can impact the outcome of the reconstruction.
 - The patient has other medical conditions that need to be addressed first.
 - The patient needs time to decide about reconstruction or needs more time to understand the types of reconstruction available.
- 3. Delayed-Immediate Reconstruction:** This is a middle-ground approach. After the mastectomy, a tissue expander (a temporary device) is placed to preserve the breast skin and shape. If radiation is needed, it's delivered with the expander in place. After radiation is complete and the tissue has healed (which can take several months), the final reconstruction is performed. This approach tries to combine the benefits of immediate reconstruction with the flexibility of delayed reconstruction.
- 4. Staged Reconstruction:** This is often done with the tissue expander-implant method. Initially, a tissue expander is placed either immediately after mastectomy or later on. Over subsequent weeks to months, the expander is gradually filled with saline to stretch the skin and chest muscle. Once the desired size is reached, the expander is replaced with a permanent implant in a separate surgery.

The decision on when to have breast reconstruction is highly individual and should be made in consultation with a team of medical professionals, including the oncologic surgeon, plastic surgeon, oncologist, and other relevant specialists. They can provide guidance tailored to the patient's medical situation, aesthetic desires, and lifestyle considerations.

Figure 2. Prompt: When can the breast reconstruction be done?

An intermediary, delayed-immediate reconstruction, employs a tissue expander post-mastectomy, with the definitive reconstructive procedure ensuing post-radiation.¹⁰ Lastly, staged reconstruction deploys an expander to incrementally stretch the dermal envelope before implantation.¹⁴ ChatGPT-4 underlines the fact that the decision on when to undergo breast reconstruction is highly individual and

should be made in consultation with a team of medical professionals, including an oncologic surgeon, a plastic surgeon, an oncologist, and other relevant specialists.

They can provide guidance tailored to the patient's medical situation, aesthetic desires, and lifestyle considerations.



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What are the risks and benefits of each option (autologous or implants)?



Both autologous (using your own tissue) and implant-based breast reconstruction methods have their own unique risks and benefits. Let's explore these for each method:

Implant-Based Reconstruction:

Benefits:

1. **Less invasive:** The surgery primarily involves the chest area without the need to harvest tissue from other parts of the body.
2. **Shorter recovery time:** Since there's no donor site from which tissue was harvested, recovery may be quicker compared to flap procedures.
3. **No additional scars** on other parts of the body, as there's no donor site.
4. **Predictable shape and size:** Surgeons can choose the exact size and shape of the implant.

Risks:

1. **Capsular contracture:** This is when the scar tissue around the implant tightens, causing the breast to feel hard. It may require further surgery.
2. **Implant rupture or leakage:** Over time, implants can rupture or leak, which might necessitate replacement.
3. **Infection:** Like any surgery, there's a risk of infection, which might require removal of the implant.
4. **Asymmetry:** The reconstructed breast might not match the other breast in size or shape.
5. **Visibility and palpability:** Especially in thin patients, the edges of the implant or ripples might be visible or felt under the skin.
6. **Limited lifespan:** Implants don't last a lifetime and may require replacement after 10-20 years.

Autologous (Flap) Reconstruction:

Benefits:

1. **Natural look and feel:** Since your own tissue is used, the reconstructed breast often feels more natural to the touch.
2. **No risk of implant-related complications:** No concerns about rupture, leakage, or capsular contracture.
3. **Permanent results:** Unlike implants, which might need replacement, flap reconstructions typically last a lifetime.
4. **Can be used in radiated fields:** If you've had radiation, autologous reconstruction often provides better outcomes than implants.

Risks:

1. **Longer surgery:** Harvesting and transplanting tissue is more time-consuming than placing an implant.
2. **Longer recovery:** Recovery involves both the chest and the donor site, which can result in a longer healing process.
3. **Scarring:** There will be scars at both the reconstructed breast and the donor site.
4. **Loss of muscle strength:** If muscle is taken, as in some TRAM or latissimus dorsi flaps, there might be a loss of strength or function.
5. **Flap failure:** There's a risk (though low) that the transplanted tissue doesn't get enough blood supply and fails. This might require additional surgery.
6. **Complications at donor site:** This includes poor healing, scarring, hernia (especially with TRAM flaps), or contour irregularities.

Decision-making:

Choosing between implant-based and autologous breast reconstruction often involves weighing these risks and benefits in the context of individual preferences, body type, medical history, and potential future treatments. It's essential to have thorough discussions with a board-certified plastic surgeon who can offer guidance tailored to the specific situation.

Figure 3. Prompt: What are the risks and benefits of each option (autologous or implants)?



What are the risks and benefits of each option (autologous or implants)?

ChatGPT-4 succinctly and correctly addresses the query, discussing risks and benefits of each option (Figure 3).

The provided information outlines the benefits and risks of two prevalent breast reconstruction methods: implant-based and autologous reconstructions. The distinctions highlight key surgical considerations like invasiveness, recovery times, and aesthetic outcomes. Importantly, the text acknowledges the fact that patient outcomes and experiences with these procedures can vary significantly.¹⁵ A critical nuance missed is the possibility of implant-associated anaplastic large cell lymphoma (BIA-ALCL) with implant-based reconstruction.¹⁶ While flap failures are rightly mentioned for autologous reconstruction, actual statistical rates can provide a clearer perspective.¹⁷ While the recommendation to consult a board-certified plastic surgeon is valid, incorporating multi-disciplinary approaches with oncologists and radiologists is equally crucial.¹⁸

Will radiation interfere with my breast reconstruction?

ChatGPT-4 succinctly and correctly addresses the query, discussing the risks of radiotherapy (Figure 4).

The provided information offers a comprehensive overview of the impact of radiation on breast reconstruction. The adverse effects of radiation, such as reduced skin elasticity and fibrotic changes, are well-documented in the literature.¹¹ The increased risk of capsular contracture post-radiation in implant-based reconstruction is supported by studies demonstrating its incidence and resultant morbidity.¹¹ The mention of radiation's effect on autologous reconstruction, especially reduced blood flow and potential flap failure, is consistent with findings on vascular complications.¹³ The elaboration on the timing of reconstruction—immediate, delayed, and delayed-immediate—is a relevant consideration for optimizing patient outcomes. Concluding the summary with the importance of multidisciplinary collaboration is vital for holistic patient care.

Will I need more surgery in a few years because of possible complications?

ChatGPT-4 response provides a comprehensive overview of breast reconstruction complications (Figure 5)

The summary elucidates potential complications and considerations following breast reconstruction. For implant-based reconstruction, the lifespan of implants and the risk of capsular contracture are consistent with the current literature.^{19,20} The

phenomenon of implant malposition and rippling is well-documented, particularly in patients with thin skin coverage.²¹ In the context of autologous reconstruction, flap failure due to compromised blood supply is a recognized complication, and the mention of donor site issues is supported by research detailing morbidity at these sites.²² The emphasis on symmetry and nipple reconstruction in the shared section underscores the multidimensional aspects of breast restoration.²³ Highlighting the importance of regular follow-ups is pertinent for optimal patient care.

Will reconstruction interfere with chemotherapy?

ChatGPT-4 provides a comprehensive, yet concise, overview of the interplay between breast reconstruction and chemotherapy, stressing the importance of individualized, patient-centered care (Figure 6)

The presented summary discusses the considerations and interactions between breast reconstruction and chemotherapy. The emphasis on the timing of reconstruction aligns with studies which indicate that immediate post-mastectomy reconstruction may delay adjuvant chemotherapy, potentially influencing oncological outcomes.²⁴ The mention of complications potentially delaying chemotherapy initiation is crucial, given that complications like infections can indeed postpone chemotherapy.²⁵ The assertion that chemotherapy can weaken the immune system and thereby impede wound healing is supported by numerous studies.²⁶

DISCUSSION

Previously, the authors conducted a study on chatbots in the context of breast augmentation.²⁹

However, breast reconstruction presents a more complex subject matter for patients, especially from a shared decision-making perspective.

In the realm of breast reconstruction, the decision-making process has always been intimately personal for patients. As this study aimed to evaluate ChatGPT's capability to address pertinent patient queries related to the subject, it highlighted a core tenet: the need for collaborative decision-making rather than a solely paternalistic stance. Emphasizing SDM, a patient-centered approach, ensures that healthcare decisions are made in tandem with patients and providers. This collaboration seamlessly melds the best clinical evidence with the patient's personal values and preferences.³⁴

Breast reconstruction, in particular, necessitates a robust SDM framework given the enduring impact such decisions have on a patient's appearance, functionality, and overall well-being.³⁵ Pivotal to enhancing SDM are comprehensive patient educational tools, including multimedia resources



GL Will radiation interfere with my breast reconstruction ?



Yes, radiation therapy can impact breast reconstruction in several ways. If you require radiation therapy after a mastectomy, it's essential to discuss the potential impact on reconstruction with your oncologist and plastic surgeon. Here's how radiation might interfere:



1. **Tissue Changes:** Radiation can cause the skin and underlying tissue to become harder, less elastic, and more fibrotic. This can lead to:
 - Reduced skin elasticity, making it difficult to stretch the skin for an implant or autologous reconstruction.
 - Changes in skin color and texture.
 - Increased risk of wound complications and poor scarring.
2. **Implant Complications:** If you have implant-based reconstruction before radiation:
 - There's an increased risk of capsular contracture (hardening of the tissue around the implant).
 - The implant might become displaced or the shape of the breast may change.
 - There's a higher risk of implant failure, meaning the implant might need to be removed or replaced.
3. **Autologous (Flap) Reconstruction:** Radiation can affect tissue viability and wound healing, potentially leading to:
 - Reduced blood flow to the transplanted tissue, increasing the risk of flap failure.
 - Fibrosis or hardening of the flap.
 - Changes in the appearance, shape, or size of the reconstructed breast over time.
4. **Delayed Healing:** Radiation can compromise blood flow, which might delay wound healing post-reconstruction.
5. **Nipple Reconstruction:** If nipple reconstruction is desired, radiation can affect the outcome by causing color changes, flattening, or poor scarring.

Timing and Sequence Considerations:


- **Immediate Reconstruction Before Radiation:** Some patients may have immediate reconstruction (at the time of mastectomy) and then undergo radiation. While this provides an immediate breast shape, it poses higher risks for complications related to radiation, especially with implants.
- **Delayed Reconstruction After Radiation:** Some patients might wait until after radiation therapy to have breast reconstruction, known as "delayed reconstruction." This can reduce some radiation-related risks, but the previously irradiated tissue may still pose challenges due to reduced elasticity and potential complications.
- **Delayed-Immediate Reconstruction:** In this approach, a tissue expander is placed immediately after the mastectomy. If radiation is needed, it's delivered with the expander in place. Once radiation is complete, the final reconstruction, often with an implant or flap, is performed.


It's crucial to work closely with both your oncology team and plastic surgeon to determine the best timing and method of reconstruction, considering the need for radiation. Individual factors, including the type of cancer, stage, and desired outcomes, will influence the decision-making process.

Regenerate

Figure 4. Prompt: Will radiation interfere with my breast reconstruction?



GL Will I need more surgery in a few years because of possible complications? 

 Whether or not you'll need more surgery in the future due to complications or other reasons depends on several factors, including the type of breast reconstruction you have, your individual health, the quality of the surgical procedure, post-operative care, and sometimes, just luck.

Here's a breakdown based on the type of reconstruction:

1. Implant-Based Reconstruction:

- **Implant replacement:** Implants don't last a lifetime. While modern breast implants are quite durable, they may eventually need to be replaced due to aging, rupture, or leakage. The average life of a breast implant can be around 10-20 years, though this can vary.
- **Capsular contracture:** This refers to the scar tissue around the implant hardening, which can cause discomfort or cosmetic issues. It's one of the more common complications and might necessitate a surgical intervention to remove or modify the scar tissue and possibly replace the implant.
- **Implant malposition:** Over time, implants may shift from their original position due to gravity, scar tissue, or other factors. Correcting this might require surgery.
- **Rippling:** In some cases, the edges or ripples of an implant might become visible under the skin. Surgery might be required to correct this or replace the implant.

2. Autologous (Flap) Reconstruction:

- **Flap revision:** Depending on how the tissue settles and heals, some women might desire or need a revision surgery to improve the shape, size, or symmetry of the flap-reconstructed breast.
- **Donor site complications:** The site from which the tissue was harvested might experience complications like hernias, contour irregularities, or scarring. Some of these complications might necessitate surgical correction.
- **Flap failure:** While rare, there's a possibility that the transplanted tissue doesn't receive enough blood supply and fails, which might require additional surgery.

3. Both Types:

- **Symmetry procedures:** To achieve better symmetry between the reconstructed breast and the natural breast, some women opt for or need additional procedures. This could be a lift, reduction, or augmentation of the opposite breast.
- **Nipple reconstruction:** If not done in the primary reconstruction surgery, some women opt for a subsequent procedure to reconstruct the nipple. Tattooing is also commonly used to recreate the areolar color.
- **Complications:** As with any surgery, there's a potential for complications like infection, poor scarring, or wound healing issues that might require surgical intervention.

While some women go through the breast reconstruction process without needing any additional surgeries, others might require or choose to have further procedures. It's essential to have regular follow-up appointments with your plastic surgeon, both to monitor for potential complications and to address any concerns or desires for aesthetic adjustments. Discussing potential future needs with your surgeon preoperatively can help set expectations and allow you to make informed decisions.

Figure 5. Prompt: Will I need more surgery in a few years because of possible complications?



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Will reconstruction interfere with chemotherapy?



Breast reconstruction does not inherently interfere with the action or efficacy of chemotherapy. However, the timing and potential complications related to reconstruction can have implications for when and how chemotherapy is administered. Here are some key points to consider:



1. **Timing of Reconstruction and Chemotherapy:**

- **Immediate reconstruction:** This is when reconstruction is done at the same time as the mastectomy. If chemotherapy is planned after the mastectomy, there may be a period of recovery needed after the reconstruction surgery before chemotherapy can start. This might delay the commencement of chemotherapy.
- **Delayed reconstruction:** In this approach, reconstruction is postponed until after all other treatments, including chemotherapy, are completed. This ensures that chemotherapy is not delayed, but it means undergoing another surgery later on.

2. **Potential Complications:** Surgical procedures carry the risk of complications such as infections, poor wound healing, or flap or implant complications. If any of these complications occur after immediate reconstruction, the start of chemotherapy might need to be delayed until the complication is resolved. This can be a significant concern, as delaying chemotherapy could potentially affect the overall treatment plan and outcome.

3. **Effect on Immune System:** Chemotherapy can weaken the immune system, which can impede wound healing and increase the risk of infections. If someone undergoes immediate reconstruction and then starts chemotherapy soon after, there might be a higher risk of surgical complications due to the weakened immune system.

4. **Radiation Considerations:** If radiation therapy is part of the treatment plan, it can influence decisions about the timing and type of breast reconstruction. Radiation can cause tissue changes, increasing the risk of complications with implants and potentially affecting the appearance and health of autologous (flap) reconstructions. In many cases, if radiation is anticipated, surgeons might recommend delaying the final reconstruction until after radiation is completed.

5. **Shared Decision-Making:** It's crucial for the surgical oncologist, medical oncologist, and reconstructive surgeon to collaborate and discuss the best overall treatment timeline for the patient. Balancing the goals of cancer treatment with the goals and benefits of reconstruction requires clear communication among the medical team and with the patient.

In summary, while breast reconstruction itself doesn't interfere with the therapeutic action of chemotherapy, the potential complications and timing of reconstruction can impact the overall treatment plan. It's essential to discuss these factors thoroughly with both the oncologist and the reconstructive surgeon to make informed decisions.

Figure 6. Prompt: Will reconstruction interfere with chemotherapy?

and decision aids.³⁶ These aids not only bolster understanding but can also optimize the time efficiency of medical consultations.³⁷

However, the contemporary healthcare landscape is mired with challenges, notably the soaring demand for medical and surgical services in the face of finite resources.²⁷ While diversifying patient education

methods and relying on auxiliary medical staff or digital resources might seem viable, nothing replaces the foundational trust built through direct doctor-patient interactions. Such rapport has proven to uplift individual post-surgical outcomes³⁰ and fortify overarching trust in healthcare systems.³¹



In this context, ChatGPT emerges as a promising assistant. Its prowess lies in distilling complex medical information into easily digestible responses without using dense medical jargon. While this study acknowledges the strength of language models like ChatGPT, it also highlights a key limitation: a general lack of personalized advice, especially in the context of breast reconstruction. These shortcomings, combined with concerns about academic rigor, underscore the need for caution before fully adopting it as a primary educational tool.^{28,29}

Supporting this observation is ChatGPT's tendency to provide broader, somewhat generalized responses — a pattern also observed in previous studies evaluating AI-driven chatbots across various surgical fields.³² The challenge lies in aligning ChatGPT's capabilities with the deeply rooted medical philosophy of providing individualized and nuanced care. Without addressing this gap, ChatGPT might risk overshadowing the specialist advice provided by surgeons, which is grounded in their meticulous evaluation of specific patient factors, ranging from surgical techniques to reconstructive decisions.³³

Despite these reservations, the study underlines the undeniable potential of ChatGPT as an auxiliary informational tool in breast reconstruction dialogues. Still, as with any research, this study is not without limitations. The questions formulated by the authors, though extensive, may not cover the entire spectrum of patient queries in every surgical setup. The 2021 knowledge cut-off of ChatGPT is another limitation, restricting the breadth of evidence. Further, the qualitative nature of this study, informed by views from a single institution, could introduce some inherent biases. An important note for future research is the plethora of chatbots beyond ChatGPT. Evaluative comparisons between these platforms might pave the way for more efficacious patient education tools in the future.

CONCLUSION

The integration of artificial intelligence (AI) tools, such as ChatGPT, into the healthcare sector offers the prospect of reshaping the informational landscape for

patients, especially in complex domains like breast reconstruction. Our research sought to evaluate ChatGPT's capacity in responding to common patient queries in this arena. While ChatGPT showcased strengths in simplifying intricate medical concepts and providing clear, evidence-based responses, its propensity to offer generalized rather than personalized guidance remains a tangible limitation. Such a lack of personalization underscores the challenge of harmonizing AI capabilities with the inherent nuances of patient care and the individualized insights provided by medical professionals.

Moreover, while ChatGPT can serve as a beneficial auxiliary tool for patient education, it cannot supplant the crucial doctor-patient relationship, rooted in trust and tailored advice. The fundamental role of shared decision-making, where healthcare decisions are collaboratively made between patients and providers, is only accentuated in domains such as breast reconstruction. Tools like ChatGPT, though promising, need to evolve further before they can seamlessly support this collaborative dynamic without diluting the core essence of individualized care.

This study, while illuminating, also underscores the need for more comprehensive research. As AI-driven tools multiply and evolve, future comparative assessments could help refine their role in healthcare, ensuring that they complement rather than compromise the quality and specificity of patient care.

ETHICAL CONSIDERATIONS

Not applicable.

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CONFLICTS OF INTEREST

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